PACIFIC NORTHWEST
U. S. FOREST SERVICE
Research Note
FOREST AND RANGE EXPERIMENT STATION • U.S. DEPARTMENT OF AGRICULTURE • PORTLAND, OREGON

PNW-61 *July 1967*

THE OCCURRENCE OF THE HEMLOCK LOOPER (*LAMBDINA FISCELLARIA* (GUENÉE)) (LEPIDOPTERA: GEOMETRIDAE) IN SOUTHEAST ALASKA, WITH NOTES ON ITS BIOLOGY

by

Torolf R. Torgersen, *Associate Research Entomologist*,
Institute of Northern Forestry
and
Bruce H. Baker, *Entomologist*, Region 10,
U.S. Forest Service, Juneau, Alaska

INTRODUCTION

In August 1965, a hemlock looper (*Lambdina fiscellaria* (Guenée)) infestation was discovered by Wrangell Ranger District personnel in river bottom stands of Sitka spruce (*Picea sitchensis*). These stands were located about 40 miles southeast of Wrangell, Alaska, on the lower north and east forks of the Bradfield River in the North Tongass National Forest (fig. 1). Within the infestation there were about 396

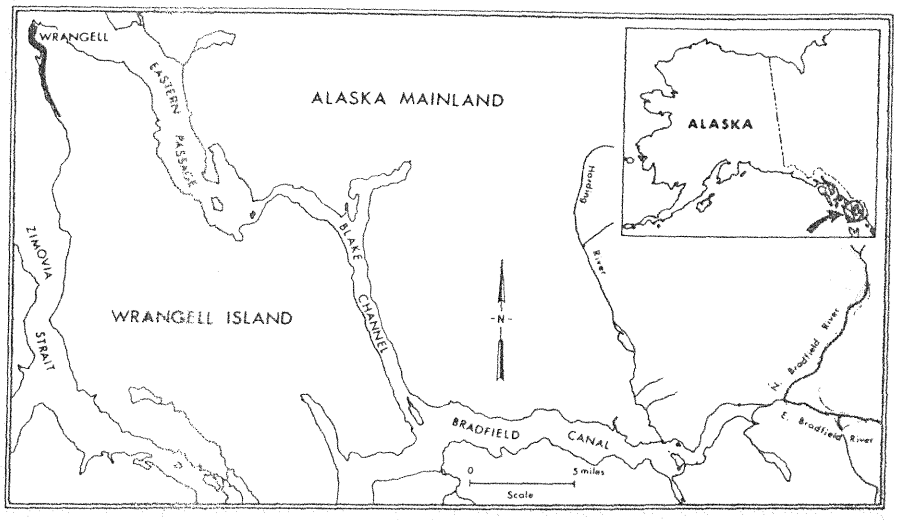

Figure 1.--Map of portions of Wrangell Island and the Alaska mainland, showing location of the hemlock looper infestation (shaded area) on the Bradfield River.

acres of heavily defoliated spruce which could be seen as rust-colored patches of damaged trees. Moths reared from eggs collected in the area were examined by D. Evans of the Forest Research Laboratory, Victoria, British Columbia, Canada, who tentatively identified them as the western hemlock looper (*L. fiscellaria lugubrosa* (Hulst)). The collection and subsequent identification of the looper is the first record of this insect in Alaska.

A study area of about 12 acres of heavily defoliated spruce was chosen on the east fork of the Bradfield River. Larval collections were made periodically from June 17 to August 11, 1966.

LIFE HISTORY

The hemlock looper has one generation per year. The adults (fig. 2) are light-brown or tan moths with a wingspan of 30 to 35 mm.

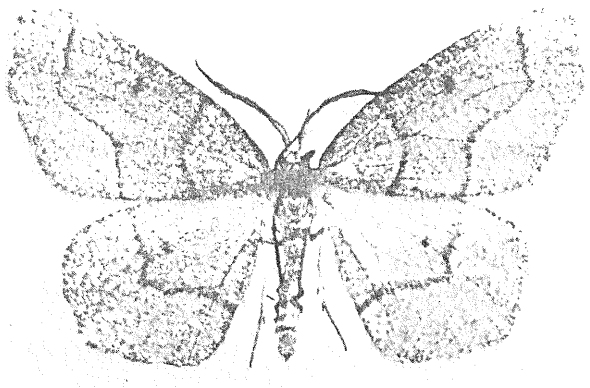

Figure 2.--Male moth of the hemlock looper from infested Sitka spruce along the Bradfield River, Alaska.

Each forewing has two irregular dark lines and a distinct dark dot. Moths began to appear during the end of August; males emerged earlier than females. Male moths (fig. 2) can be distinguished from females by their plumelike antennae; females have threadlike antennae. The sex ratio is 1:1 (n=897). Although the end of the moth flight and oviposition period was not observed in the Bradfield area, it is probable that adults were present through the end of September. Very little flight was noted during field observations, which probably resulted from the cool, rainy weather at that time. Most of the moths were found clinging to bark scales on the boles of trees.

The looper overwinters in the egg stage. The eggs are small (about 0.6 mm. long), oval, and grayish green with a very finely punctate reflective surface. Eggs are laid on the upper bole and branches, on ground vegetation, and in the lichens and mosses on the lower tree boles.

The eggs hatch during the first or second week in June and the newly emerged larvae move upward and outward in the crown where they begin to feed. First-instar larvae are about 5 mm. long and have distinct transverse bands of black and white on the body. The later instar larvae have various patterns of lines, stripes, and spots giving them a mottled appearance. A distinctive feature in the patterning of late-instar larvae is the presence of four dark spots on each abdominal segment (fig. 3). Preliminary studies indicate that the larvae have four instars in the Bradfield River area. This differs from the findings of Hopping, Thomson, and Carolin,[1/] who stated that the looper in British Columbia, Canada, and Washington had five larval instars.

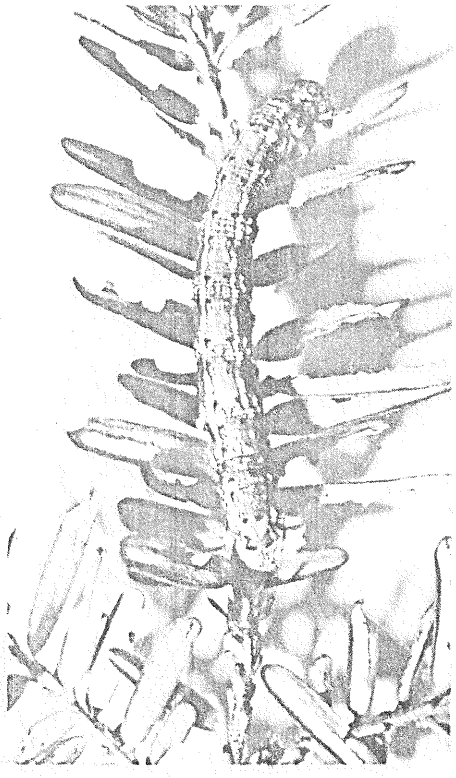

Figure 3.--Late-instar hemlock looper larva feeding on western hemlock.

[1/] Hopping, G. R. An account of the western hemlock looper, *Ellopia somniaria* Hulst, on conifers in British Columbia. Sci. Agr. 15: 12-29, illus. 1934.

Thomson, M. G. Appraisal of western hemlock looper infestations. Forest. Chron. 33: 141-147. 1957.

Carolin, V. M. Studies on western hemlock looper in southwest Washington in 1962. Illus. 1964. (Unpublished progress report on file at the Pacific Northwest Forest & Range Exp. Sta., U.S. Forest Serv., Portland, Oreg.)

Gryse and Schedl[2/] who worked with the eastern form of the looper in Ontario, Canada, also found five instars. However, Carroll, [3/] who worked on the biology of the hemlock looper in Newfoundland, found only four instars. Additional studies will establish the number of larval instars in coastal Alaska with more certainty.

After emerging, young larvae fed on new foliage, but later in the larval development period old foliage was eaten. Often only a few bites were taken out of each needle (fig. 3). The remains of partially eaten dead or dying needles turned reddish brown giving heavily attacked trees a red tinge. Larval feeding and subsequent needle fall stripped many trees completely (fig. 4).

Figure 4.--Defoliated Sitka spruce in infestation area along Bradfield River, Alaska.

[2/] Gryse, J. J. de, and Schedl, K. An account of the eastern hemlock looper, *Ellopia fiscellaria* Gn., on hemlock, with notes on allied species. Sci. Agr. 14: 523-539, illus. 1934.

[3/] Carroll, W. J. History of the hemlock looper, *Lambdina fiscellaria fiscellaria* (Guen.), (Lepidoptera: Geometridae) in Newfoundland, and notes on its biology. Can. Entomol. 88: 587-599. 1956.

Sitka spruce was the preferred host in the Bradfield infestation. Western hemlock (*Tsuga heterophylla*) was also attacked, but to a far lesser degree than spruce. Even when overstory spruce was completely defoliated, the codominant and understory hemlock was not heavily attacked. Some feeding also took place on understory species as evidenced by skeletonized leaves. Among the understory plants most commonly attacked were mooseberry viburnum (*Viburnum pauciflorum*), ovalleaf whortleberry (*Vaccinium ovalifolium*), and redosier dogwood (*Cornus stolonifera*).

Defoliation in the overstory trees was evident from the air by mid-July, but was more pronounced by the end of July and early August. This coincided roughly with the peak occurrence of the third instar. Throughout the latter part of the feeding period, larvae were commonly seen descending to the ground and understory vegetation on silken threads.

At the end of the feeding period the late-instar larvae sought pupation sites under moss and bark scales, and in crevices of rotting tree stumps where they pupated. The pupa (fig. 5) is characterized by its tan coloring and dark-brown spots. The pupal period, which began about the end of the first week in August, lasted for 14 to 20 days.

Figure 5.--Hemlock looper pupa. Final instar larval skin is at upper right.

NATURAL MORTALITY FACTORS

Field and laboratory studies revealed two sources of looper mortality. Late-instar larvae succumbed to a virus disease, and parasites caused pupal mortality.

Beginning in late July, larvae were noticeably less common in the field. There was heavy mortality among late-instar larvae in the laboratory as well. The disease affecting the larvae was later identified by G. Thomas, University of California, Berkeley, as a polyhedrosis virus.

Insect parasites were also active in the Bradfield River infestation. No adult parasites were recovered from laboratory-reared looper larvae. However, dissections of looper larvae revealed the presence of parasite larvae. The pupal parasite complex appears to consist of about six species. Approximately 27 percent of the looper pupae collected in the field were parasitized.